

## REMARKS

### 35 U.S.C. § 112 Rejections

The Examiner has rejected claims 1 and 4 under 35 U.S.C. §, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Specifically, the Examiner states that the term "highest" in claims 1 and 4 is a relative term which renders the claim indefinite. Applicant has removed the term "highest" from claims 1 and 4 without prejudice. Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 1 and 4 under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

### 35 U.S.C. § 102 and 103 Rejections

The Examiner has rejected claims 1-5, 13-17, 19-21, and 22-23 under 35 U.S.C. § 102(e) as being anticipated by, or under 35 U.S.C. § 103(a) as being unpatentable over Dunand. Claims 7-9 and 12-24 have been cancelled. Claims 1 and 4 are the only independent claims in this group rejected by the Examiner. Applicant submits that claim 1, as amended, is not anticipated by and is patentable over Dunand.

The Examiner states as follows on Page 4, lines 10-11:

*... identical compositions have identical characteristics and properties.*

The manner according to which the superconductor of the present invention is put together is more than the sum of its parts. Specifically, current conducts primarily through the conductive material of the superconductor. By contrast, because of the way that the superconductor of Dunand is put together, current conducts primarily through the superconducting phase, for example  $\text{MgB}_2$ .

Dunand, in column 5, lines 37-44, states as follows:

*The inventive method includes providing a particulate ceramic component operative at a critical temperature as a superconductor of current, such component arranged to have a predetermined, or performed [preformed?] configuration with porosity; and introducing a melted or liquid metallic component into the porosity of the preconfigured/ preformed ceramic component.*

Because of the way that the ceramic component is assembled into a preform, the particulate ceramic component particles all contact one another. The purpose for the ceramic component particles to contact one another is stated in column 1, lines 29-30:

*For instance, any cracks in the diboride phase will interrupt the superconducting pathway.*

Because of its structure, the majority of the current will carry through the superconducting phase. For example,  $\text{MgB}_2$  has a critical current density of approximately  $1,000,000 \text{ A/cm}^2$  at 20K, whereas gallium metal located adjacent to  $\text{MgB}_2$  has a critical current density of approximately  $50,000 \text{ A/cm}^2$  at 20K. In a putative example, where Dunand may have 50%  $\text{MgB}_2$  and 50% gallium, a cross-section normal to the direction that current flows would reveal an  $\text{MgB}_2$  surface area of 50% and a gallium surface area of 50%. In such an example, for currents

approaching the critical current of the structure, the current flowing through the  $\text{MgB}_2$  would be approximately 2,000 times as much as the current flowing through the gallium. The Examiner states on Page 4 that the matrix volume can be 80% by volume. Applicant could find no supporting example for such a percentage as it relates to  $\text{MgB}_2$ . Be that as it may, the current carried by the  $\text{MgB}_2$  would still be at least two orders of magnitude more than the current carried by the gallium.

The current thus conducts primarily through the superconductive material and not through the conductive material in Dunand. It should be noted that column 9, lines 19-47 does describe an example of a discontinuous superconducting phase, but that is for non-current-carrying applications.

Claim 1 has been amended to state that the current in the present invention conducts primarily through the conductive material of the superconductor. Figure 17, for example, illustrates where current conducts. It can be seen that the superconducting path 38 is through the conductive material 52, and not through the particles 50. To assist the Examiner in understanding how the composite of Figure 16 is put together, it can be noted that should it be possible to remove the matrix material 52, the particles 50 would return to powder and not manifest themselves into a preform.

Applicant therefore submits that claim 1 is not anticipated and is patentable over Dunand, because claim 1 has at least one limitation that is not suggested by Dunand. Claims 2 and 3 depend from claim 1, and should be allowable for at least the same reasons as claim 1.

With regard to claim 4, the Examiner states as follows on Page 4, lines 13 and 14:

*... The prior art teaches mixing the  $MgB_2$  and the metal matrix powders...*

It should be noted that claim 4 as examined did not include the word "mixing," which has been added by this amendment. Column 10, lines 44-49 of Dunand state as follows:

*A quantity of 8-10 grams of  $MgB_2$  powder was put into a crucible. Infiltrations with magnesium were made in steel crucibles, while infiltrations with aluminum and zinc were made in alumina crucibles, because magnesium may react with alumina and aluminum and zinc react with steel.*

The  $MgB_2$  powder is thus infiltrated with magnesium. Magnesium does not have sufficient lambda value to be driven to a superconducting state. Be that as it may, infiltration is not mixing. Dunand thus does not describe mixing of superconductive particles with conductive material, as will be understood by a person skilled in the art.

Claim 4 now includes the limitation that the superconducting particles are mixed with the conductive material. Claim 4 thus includes at least one limitation that is not suggested by Dunand. Claim 5 depends from claim 4, and should be allowable for at least the same reasons as claim 4.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 1-5 under 35 U.S.C. § 102(e) as being anticipated by, or under 35 U.S.C. § 103(a) as being unpatentable over Dunand.

The Examiner also rejected claims 6, 18, and 24 under 35 U.S.C. § 103(a) as being unpatentable over Dunand. Claim 6 depends from claim 4, and should be allowable for at least the same reasons as claim 4. Claims 18 and 24 have been cancelled. Applicant respectfully requests withdrawal of the rejection of claim 6 under 35 U.S.C. § 103(a) as being unpatentable over Dunand.

The Examiner also rejected claims 7-11 under 35 U.S.C. § 102(e) as being anticipated by Dunand in view of Ottavio, and has rejected claims 7-12 under 35 U.S.C. § 103(a) as being unpatentable over Dunand in view of Ottavio. This includes independent claim 10. Applicant submits that claim 10, as amended, is patentable over Dunand in view over Ottavio.

As noted above, Dunand, in column 1, lines 29-30, specifically states that cracks in the diboride phase are undesirable. Dunand thus specifically teaches that the structure of the preform should not be disrupted for current-carrying applications. Should the preform thus be drawn into a wire, cracks would appear in the preform, which would be undesirable, according to Dunand. Dunand thus teaches away from the use of the preform for purposes of drawing wire.

Ottavio adds nothing to Dunand in this respect. It appears that the Examiner has simply cited Ottavio because of the disclosure of non-crystallized gallium.

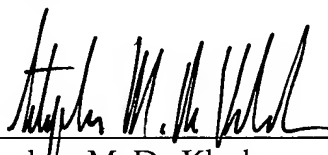
Claim 10 includes the limitation that the elongate member is drawn into a wire. Claim 10 thus includes at least one limitation that is not suggested by Dunand or Ottavio, alone or in combination. Claim 11 depends from claim 10, and should be allowable for at least the same reasons as claim 10.

Applicant, accordingly, respectfully requests withdrawal of the rejections of claims 10 and 11 under 35 U.S.C. § 102(e) as being anticipated by Dunand in view of Ottavio, or under 35 U.S.C. § 103(a) as being unpatentable over Dunand in view of Ottavio.

If there are any additional charges, please charge Deposit Account No. 02-2666.

Respectfully submitted,

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